Serial No. 09/900,618

REMARKS

In view of the following discussion, the Applicants submit that none of the claims now pending in the application is anticipated under the provisions of 35 U.S.C. § 102 or made obvious under the provisions of 35 U.S.C. § 103. Thus, the Applicants believe that all of these claims are now in allowable form.

In addition, the Applicants' representative would like to thank Examiner Harper for kindly taking a substantial amount of time on February 15, 2007 to discuss the merits of the subject invention. The Applicants' representative is aware of the time constraint that is placed on the Examiner and is appreciative of the Examiner's willingness to devote such large quantity of time to discuss the case on the merits.

I. REJECTION OF CLAIMS 1-3, 5, 17 AND 20-21 UNDER 35 U.S.C. § 102

The Examiner has rejected claims 1-3, 5, 17 and 20-21 under 35 U.S.C. §102(e) as being anticipated by the Jamoussi et al. patent (United States Patent No. 6,128,280, issued on October 3, 2000, hereinafter "Jamoussi"). In response, the Applicants have amended independent claims 1 and 20, from which claims 2-3, 5 and 21 depend, as well as independent claim 17, in order to more clearly recite aspects of the present invention.

The Examiner's attention is respectfully directed to the fact that Jamoussi fails to teach, show or suggest a method for transmitting packets in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth (as a rate priority percentage), such that with the nominal departure rate and the minimum allocation working concurrently, <u>actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate</u>, as recited by the Applicants' amended independent claims 1, 17 and 20. In particular, the Applicants' claims 1, 17 and 20, as amended, positively recite:

    1.   In a network comprising a plurality of router nodes connected in the network by communication links, a method of providing quality of service assurances for transmitting packets over a channel, the method comprising:
        defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

Serial No. 09/900,618

allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is operating at an anticipated nominal bandwidth; and

assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class as a rate priority percentage if the available bandwidth of the channel is operating at less than the nominal bandwidth, such that with the nominal departure rate and the rate priority-based minimum allocation working concurrently, actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

17.   In a network, a router node that supports differentiated services, the router node comprising:

a classifier defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

an allocater allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of a channel that transmits at at least a nominal bandwidth is operating at the nominal bandwidth; and

a rate prioritizer assigning each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class as a rate priority percentage if the available bandwidth of the channel is operating at less than the nominal bandwidth, such that with the nominal departure rate and the rate priority-based minimum allocation working concurrently, actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

20.   An article of manufacture having computer-readable program means embodied thereon for providing quality of service assurances for transmitting packets over a channel that transmits at at least a nominal bandwidth, the article comprising:

computer-readable means for defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

computer-readable means for allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is operating at the nominal bandwidth; and

computer-readable means for assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class as a rate priority percentage if the available bandwidth of the channel is operating at

Serial No. 09/900,618

less than the nominal bandwidth, <u>such that with the nominal departure rate and</u> <u>the rate priority-based minimum allocation working concurrently, actual</u> <u>bandwidth allocated to a given class at a given time is no less than the minimum</u> <u>allocation, but no more than the nominal departure rate,</u>

      wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

The Applicants' invention is directed to a per hop behavior for DiffServ in mobile ad hoc wireless networks. Approaches for QoS designed for fixed wired networks tend to be inadequate for wireless networks due to the unpredictability of their behavior. In particular, the dynamic nature of wireless network topologies (e.g., due to the mobility of the linked devices) and the peculiarities of signal propagation over wireless links (which tend to cause frequent changes to the states of the links) often cause a wireless network to be subject to higher data losses and more frequent bandwidth reallocations than traditional wired networks.

The Applicants' invention attempts to address this inadequacy by providing a per hop behavior for differentiated services in mobile ad hoc wireless networks. For example, in one embodiment, the Applicants provide a method whereby bandwidth for a link capable of transmission at a nominal bandwidth is allocated among a plurality of packet classes. At any given time, the specific amount of bandwidth allocated to a given class depends on how much of the nominal bandwidth is being consumed. Thus, each class is associated with: (1) a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is operating at the nominal bandwidth; and (2) a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth. The nominal departure rate and the minimum allocation work concurrently such that the actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate. Either or both of the nominal departure rate and the minimum allocation of the available bandwidth is dynamically changeable, such that it/they may be adjusted to compensate for changing bandwidth availability resulting from changing network topology (e.g., changes in link conditions). Thus, the Applicants' invention may be

Serial No. 09/900,618

particularly well-suited for implementation in applications for wireless links and/or highly mobile networked devices.

By contrast, Jamoussi teaches a method in which a pool or class is allocated a single quantity or percentage of available bandwidth, regardless of the actual amount of total available bandwidth available. Thus, Jamoussi does not teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth that work concurrently to determine the actual amount of bandwidth allocated to the class at a given time.

Specifically, the cited portions of Jamoussi at most teach that pools (or classes) are allocated a specific percentage of the total available bandwidth. When the total available bandwidth is reduced (e.g., due to link failure), the bandwidth loss is distributed among the pools according to the percentages of total bandwidth allocated thereto. Thus, each pool always receives the same percentage of the total bandwidth, regardless of what the actual total bandwidth is. This is not the same as providing a pool (or class) with both a nominal departure rate when a channel is transmitting at a nominal bandwidth and a separate minimum allocation of bandwidth when bandwidth falls below the nominal amount, such that the actual bandwidth provided to the class at a given time is determined by the nominal departure rate and the minimum allocation working concurrently. Thus, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation (fixed lower limit) of available bandwidth, such that with the nominal departure rate and the minimum allocation working concurrently, actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate as recited in Applicants' amended independent claims 1, 17 and 20. Thus, the Applicants respectfully submit that claims 1, 17 and 20, as amended, fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

Dependent claims 2-3, 5, and 21 depend from claims 1 and 20 and recite additional features therefore. As such, and for at least the reasons set forth above, the

10

Serial No. 09/900,618

Applicants submit that claims 2-3, 5, and 21 are not anticipated by the teachings of Jamoussi. Therefore, the Applicants submit that dependent claims 2-3, 5, and 21 also fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder.

II. REJECTION OF CLAIMS 4, 6-14 AND 18-19 UNDER 35 U.S.C. § 103

1. Claims 4, 10 and 13-14

The Examiner rejected claims 4, 10 and 13-14 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi in view of the Soumiya et al. patent (United States Patent No. 5,818,818, issued October 6, 1998, hereinafter "Soumiya"). In response, the Applicants have amended independent claim 1, from which claims 4, 10 and 13-14 depend, in order to more clearly recite aspects of the present invention.

As discussed, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth, such that with the nominal departure rate and the minimum allocation working concurrently, <u>actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate</u>, as positively recited by Applicants' amended independent claim 1. Soumiya similarly fails to teach or suggest assigning a nominal packet departure rate <u>and</u> a minimum allocation of available bandwidth; thus, Soumiya does not bridge the gap in the teachings of Jamoussi. Therefore, the Applicants submit that for at least the reasons set forth above, independent claim 1, as amended, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Dependent claims 4, 10 and 13-14 depend from claim 1 and recite additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claims 4, 10 and 13-14 are not made obvious by the teachings of Jamoussi in view of Soumiya. Therefore, the Applicants submit that dependent claims 4, 10 and 13-14 also fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

11

Serial No. 09/900,618

2. Claims 6-9 and 18-19

The Examiner rejected claims 6-9 and 18-19 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi. In response, the Applicants have amended independent claims 1 and 17, from which claims 6-9 and 18-19 depend, as discussed above, in order to more clearly recite aspects of the present invention.

Jamoussi has been discussed above. As discussed, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth, such that with the nominal departure rate and the minimum allocation working concurrently, actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate, as positively recited by Applicants' amended independent claims 1 and 17. Therefore, the Applicants submit that for at least the reasons set forth above, independent claims 1 and 17, as amended, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

Dependent claims 6-9 and 18-19 depend from claims 1 and 17 and recite additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claims 6-9 and 18-19 are not made obvious by the teachings of Jamoussi. Therefore, the Applicants submit that dependent claims 6-9 and 18-19 also fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

3. Claim 11

The Examiner rejected claim 11 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi in view of Soumiya and further in view of the Vaman et al. patent (United States Patent No. 6,011,780, issued January 4, 2000, hereinafter "Vaman"). In response, the Applicants have amended independent claim 1, from which claim 11 depends, as discussed above in order to more clearly recite aspects of the present invention.

As discussed, Jamoussi and Soumiya fail to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet

12

Serial No. 09/900,618

class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth, such that with the nominal departure rate and the minimum allocation working concurrently, <u>actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate</u>, as positively recited by Applicants' amended independent claim 1. Vaman similarly fails to teach or suggest assigning a nominal packet departure rate <u>and</u> a minimum allocation of available bandwidth; thus, Vaman does not bridge the gap in the teachings of Jamoussi and Soumiya. Therefore, the Applicants submit that for at least the reasons set forth above, independent claim 1, as amended, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Dependent claim 11 depends from claim 1 and recites additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claim 11 is not made obvious by the teachings of Jamoussi in view of Soumiya and further in view of Vaman. Therefore, the Applicants submit that dependent claim 11 also fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

4. Claim 12

The Examiner rejected claim 12 under 35 U.S.C. §103(a) as being unpatentable over Jamoussi in view of the Kuehnel et al. patent (United States Patent No. 5,907,542, issued May 25, 1999, hereinafter "Kuehnel"). In response, the Applicants have amended independent claim 1, from which claim 12 depends, as discussed above in order to more clearly recite aspects of the present invention.

As discussed, Jamoussi fails to teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a packet class is assigned both a nominal packet departure rate and a minimum allocation of available bandwidth, such that with the nominal departure rate and the minimum allocation working concurrently, <u>actual bandwidth allocated to a given class at a given time is no less than the minimum allocation, but no more than the nominal departure rate</u>, as positively recited by Applicants' amended independent claim 1. Kuehnel similarly fails to teach or suggest assigning a <u>nominal packet departure rate</u> and a <u>minimum</u>

13

Serial No. 09/900,618

allocation of available bandwidth; thus, Kuehnel does not bridge the gap in the teachings of Jamoussi. Therefore, the Applicants submit that for at least the reasons set forth above, independent claim 1, as amended, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Dependent claim 12 depends from claim 1 and recites additional features therefore. As such, and for at least the reasons set forth above, the Applicants submit that claim 12 is not made obvious by the teachings of Jamoussi in view of Kuehnel. Therefore, the Applicants submit that dependent claim 12 also fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

III. CONCLUSION

Thus, the Applicants submit that all of the presented claims now fully satisfy the requirements of 35 U.S.C. §102 and 35 U.S.C. §103. Consequently, the Applicants believe that all the presented claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

Date: _3/1/07_
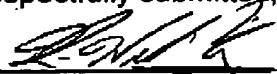
Kin-Wah Tong, Attorney
Reg. No. 39,400
(732) 530-9404

Patterson & Sheridan, LLP
595 Shrewsbury Avenue
Shrewsbury, New Jersey 07702

14